

Validation of the External IHSA Dilution Method for Measurement of Relative Changes in Cerebral Blood Flow in Rapid Succession

H. UEDA, S. HATANO, T. KOIDE and T. GONDAIRA

*The Second Department of Internal Medicine, Faculty of Medicine,
University of Tokyo, Tokyo*

A method has been developed by us with which relative changes in cerebral blood flow can be determined in rapid succession. The purpose of the present investigation was to correlate the values with this method with those obtained by inert gas method, in order to ascertain its validity.

Study was made in 15 subjects with ages between 28 and 69 years. Four of them were patients with cerebrovascular disease, 3 with hypertension and the remaining 8 were without diseases affecting cardiovascular or nervous system.

Measurement of cerebral blood flow was made in recumbent position using the conventional N₂O desaturation method. Immediately thereafter, 40 μ c of IHSA in 0.5 ml of physiological saline was injected rapidly into a common carotid artery, and a dilution curve was recorded externally at the frontal area of the skull using a scintillation counter. The dilution curve showed a exponential downslope ($C=C_0e^{-Kt}$), of which the exponential coefficient K was determined graphically. A few minutes after injection of IHSA, radioactivity attained to an equilibrium, thereafter its changes by experimental procedures were postulated to indicate the changes in cranial blood volume. These measurements were repeated again during inhalation of 5 to 7% CO₂ or 85% O₂ in air.

Relative changes in cerebral blood flow induced by the inhalation was calculated by multiplying the percent changes of K with changes in cranial blood volume.

Average increase in cerebral blood flow induced by CO₂ in 5 patients was 29.4% (19.0~35.5%) by IHSA method, showing a good agreement with N₂O method which demonstrated an increase of 32.6% on average (14.4~45.4%). Inhalation of 85% O₂ reduced cerebral blood flow in 3 patients ranging from -11.2 to -21.5% (mean -17.7%) by IHSA method, while corresponding values measured with inert gas ranged from -6.0 to -19.3% (mean -14.7%), again showing a good correlation in both methods. Cranial blood volume showed an average increase of 12% after CO₂ inhalation in 9 patients, and an average decrease of -9.2% after 85% O₂ inhalation in 6 subjects. These observations indicated that changes in cranial blood volume may play a significant role in changing K induced in our experimental procedures.

Validity of IHSA dilution method for measurement of relative changes in cerebral blood flow was demonstrated in man. Correction of changes in K with changes in cranial blood volume was thought to be essential in this method.

The Study of Cerebral Hemodynamics with the Use of RI—Especially on the Mean Cranial Circulation Time when Vasopressor Drug and Cold Test were given

J. ATARASHI, M. YOSHIMURA, K. HARA, A. TERASHI, M. YAMATE,
T. MIYAZAKI, T. KIKUCHI, H. IWASAKI and T. YAMANO

The Second Department of Internal Medicine, Nippon Medical School

We have already attempted to study the cerebral hemodynamics in cerebral vascular diseases under estimation of cerebral blood

volume (CBV), mean cranial circulation time (MCCT) by the external tracing technique of isotope after direct injection into one of the